ficulties in the application of the system to the war-vessel may not be fatal to employment there.

Incidentally, a fact in sociology and economics comes into view. It was found impracticable to carry on work of research with men employed under the conditions obtaining in civil life and enlisted men were necessarily put on the work. Only men who would obey orders, work when required by the exigencies of the service and faithfully attend to duty, as in army and navy, could be relied upon. The trade-union rules were found to be fatal to efficiency, and the inference seems to have been plain that, in the industrial army as in the public service, effectiveness is not promoted where the rank and file take command.

The workings of the 'personnel bill' are commented upon with the conclusion that Mr. Roosevelt's bill is correct in plan and in principle, but that it has not been executed with either zeal or faithfulness, and that the efficiency of a navy dependent upon technical knowledge and practical experience, conjoined with high scientific attainments, is being seriously jeopardized by this disloyalty to law and to the service. Junior officers, it is stated, are not given either the scientific training or the professional training as mechanical engineers which are essential to the efficient operation of the 'engineer's war-engine,' as the writer has called the modern armored vessel, with its interior crowded with steam-engines and other machinery and electrical apparatus. Without extensive practical experience and a sound scientific education high efficiency cannot be hoped for, and the safety of the nation is too serious a matter to be subject to such risks as are sure to follow lack of zeal or of training in the management of so tremendous an engine of war as the armor-clad or cruiser. An 'emphatic general order' and rigid enforcement is demanded as essential, and immediately.

National ascendency on the seas and permanent safety against foreign aggression can only be insured by a sufficient and an efficient personnel as well as an amply powerful fleet. The navy of the United States, like that of Great Britain, needs men more than ships, to-day, and every proper means should be resorted to to make the service attractive and to secure competent officers, particularly in its departments of applied science.

Admiral Melville retires presently and this is his last official report. It is wise, frank and emphatic in its discussions of the requirements of a 'new navy' in the twentieth century. The influence of this testimony should be powerful and effective. The Chief of Bureau goes out of office leaving behind him a magnificent record of accomplishment, not only in the building up of the navy, but in achievements which, in variety as in importance, have probably never been rivaled.

R. H. THURSTON.

SCIENTIFIC JOURNALS AND ARTICLES.

The Journal of Physical Chemistry, October.—'Solubility, Electrolytic Conductivity and Chemical Action in Liquid Hydrocyanic Acid,' by Louis Kahlenberg and Herman Schlundt. This is a continuation of the researches of the authors on solutions with other solvents than water. Lists of substances soluble and insoluble in liquid hydrocyanic acid are given. In the case of some solutes the electrical conductivity is greater than in water, while in other cases, notably with the acids, it is less. 'The Expansion of a Gas into a Vacuum and the Kinetic Theory of Gases,' by Peter Fireman. An abstract of this paper has already appeared in this journal (SCIENCE, N. S., XVI., 285). 'On the Displacement of Equilibrium,' by Paul Saurel. 'On the Critical State of a One-Component System,' by Paul Saurel.

SOCIETIES AND ACADEMIES.

PHILOSOPHICAL SOCIETY OF WASHINGTON.

AT the 557th meeting of the Society, held on November 8, Mr. C. G. Abbot, of the Astrophysical Observatory, described 'a device to obtain time signals of any desired interval from a clock work of uniform motion.' A chronograph with the attachment was exhibited. Signals at equal intervals of from one half second up to ninety seconds could be obtained. An adjustment was provided by means of which the whole series

of signals could be hastened or delayed without alteration of the interval. The interval itself could be altered at pleasure while the apparatus was in operation. Though the design was illustrated primarily as a mechanical device which might find many applications, it was pointed out that it was immediately applicable to Mr. Langley's method of preventing personal equation in transit observations.

Mr. W. J. Spillman, of the U. S. Department of Agriculture, read a paper on 'The Theory of Combinations Applied to Mendel's Law.' He first stated briefly the law, which expresses the probable character of hybrids and their progeny, and the theory which Mendel and others had proposed to explain the facts in the case, illustrating the theory for monohybrids and dihybrids, and giving general formulæ he had deduced for finding the number of types that may be expected in the progeny of any hybrid, and the relative proportion of each type in any generation of any hybrid. He then showed what departures from the law may be caused by chance distribution of parent characters in the progeny. Taking the hypothetical case in which each hybrid produces ten ovules, he showed that "the chance that five shall possess a character of one parent and five the corresponding opposite character of the other parent is 25 per cent. In other words, when there are ten ovules on each plant, in 25 per cent. of the cases we may expect to find the pair of characters distributed amongst the ovules exactly as called for by theory. In .1 per cent. of the cases all the ovules will possess the character of one parent, and all will possess the character of the other in a like number of cases. If each plant has 100 ovules, the pair of parent characters will be equally distributed in only 8 per cent. of the cases." The chance than any particular distribution of a pair of characters amongst the ovules shall occur was shown to be

$$\frac{n!}{2^n r!\,(n-r)!},$$

where $n =$ the number of ovules per plant, and $r =$ the number of ovules on any plant that possesses the same parent character. He also gave a formula to show the chance that the pollen which shall fertilize these ovules shall be such as to give any particular combination of the possible types in the progeny. Lantern illustrations showed the results obtained by crossing varieties of wheat, and graphically some of the results of mathematical analysis.

Mr. Marcus Baker then discussed the question 'Can the Equations

$$\left.\begin{aligned} x^2 + y &= a \\ x + y^2 &= b \end{aligned}\right\}$$

be Solved by Quadratics?' He pointed out some relations of this problem to the theory of equations, showed that the general method of solving equations of the second and third degrees consists in reducing their degree or in transforming them to some typical form which is solvable, and gave the criteria by which the few solvable types of equations of the fourth degree may be recognized. According to these criteria the given equations cannot be solved by direct methods.

At the 556th meeting of the Society, held October 25, Professor S. W. Stratton, director of the National Bureau of Standards, spoke on 'The Present Status of the Metric System in the United States and Great Britain,' detailing the various attempts to obtain permissive legislation, and some of the numerous associations and societies that had forwarded memorials to Congress.

Professor E. B. Rosa, also of the bureau, then by invitation, with the aid of lantern views, described the 'Plans for the Buildings of the National Bureau of Standards.' One building is to contain all the machinery, while another is to be as free as possible from jar; every modern convenience is to be provided in the various rooms, the temperatures of which will be regulated by thermostats controlling the supply of dust-free warm or cooled air.

Charles K. Wead,
Secretary.

NEW YORK ACADEMY OF SCIENCES, SECTION OF ASTRONOMY, PHYSICS AND CHEMISTRY.

At the meeting of October 6, 1902, the program of the evening was made up of informal

reports of the members upon work done during the summer in matters of interest to the section.

George F. Kunz exhibited a section of the tusk of the elephant Tip that was killed several years ago because he had become so cross. The section of the tooth showed a large cavity amounting to a couple of cubic inches, near the end of the conical cavity at the root of the tooth. It was suggested that possibly this cavity represented an ulceration of the tooth and that the bad humor of the elephant was really due to a bad tooth. After discussion by Professor Cattell and others, it was apparently the opinion of those best qualified to know that this cavity was not the result of any such ulceration, and that probably the elephant would not suffer from toothache in any case.

William Hallock made an informal report upon barometric and boiling-point observations made during the ascent of Mt. Whitney during the month of August. He called attention to the use of the boiling-point apparatus as checking the barometer, and to the necessity of taking into consideration the temperature and humidity of the air, as well as the simple barometric pressure. He also referred to certain interesting lava fields on Whitney Creek to the southwest from Mt. Whitney.

G. B. Pegram gave an interesting account of the work done at the magnetic observatories in this country, and especially at the one at Cheltenham, Md., with which he was connected during the summer vacation.

Dr. D. S. Martin referred to the interesting minerals exhibited at the exposition of the South at Charleston, and showed a sample of the ash from Mt. Pelée which was brought to Charleston on one of the incoming vessels. He will report more in detail upon this subject in the section of mineralogy later on.

S. A. MITCHELL,
Secretary of Section.

TORREY BOTANICAL CLUB.

AT the meeting of the Club on October 29 the first paper presented was by Miss F. A. Mulford, 'Remarks on *Gerardia decemloba*, Greene,' with exhibition of specimens. The plant was found at Hempstead, Long Island, September 5, 1902. This is the second station for the species, it having first been found by Professor Greene at Washington, D. C., in 1898. Dr. Britton followed with remarks upon the peculiar physiography of the Hempstead plain, its isolation, and the lack of trees, which is perhaps due to fires.

The second paper was by Miss Anna Murray Vail, on 'Some Rare Books Recently Added to the Library of the New York Botanical Garden.' This will shortly appear in the *Journal of the Botanical Garden.* Among some 400 works of the older botany recently procured by the Garden and now exhibited to the Club, the oldest is a fifteenth century Gothic manuscript of Macer Floridus' 'De virtutibus herbarum.' The oldest printed volume is one of the 'Ortus Sanitatis,' from the end of the fifteenth century; the next, the Venice edition of 1509 of the 'Aggregator practicus,' one of the herbals often known simply as 'Herbarius.' Later notable works secured include many of those of Mattioli, Dodoens and Lobel; the rare first volumes issued by Dodoens (his 'De frugum,' 1552) and by Clusius (1557); also a copy of Clusius' greatest work, his 'Rariorum' of 1601, of special interest because a presentation copy from Clusius himself. Rarities include a Passaeus of 1614, and the elephant folio of the 'Hortus Eystettensis' of 1613, in unusually fine preservation. There is a fine copy of Rivinus of 1690; and one of Linnæus' rarest works, his autobiographical pamphlet of 1741, 'Orbis eruditi,' believed to exist in only four copies.

The third paper was by Dr. Rydberg, 'A Review of a Recent Monograph of *Campanula rotundifolia* and its Allies.' Discussing this paper, Dr. MacDougal called attention to the work of Goebel on this plant. He said that Goebel had been able to produce rounded leaves on *Campanula* by experiment, and in any part other than the inflorescence, but that it had not been possible to prevent the formation of the rounded basal leaves.

The final paper was given by Dr. Arthur Hollick, on 'Buried Swamp Deposits of Maryland.'

Along the shores of the Chesapeake Bay swamp deposits of the Pleistocene era are being uncovered by water action. These occur under from five to thirty feet of gravels. Among the vegetable remains discovered, there were described and shown stumps of the bald cypress, cones of two species of *Pinus* (*P. echinata* and *P. Strobus*), with beech and hickory nuts. Many seeds are now being determined by experts of the Department of Agriculture. When the determination of the seeds is completed a good account of the ancient flora of that region can be given.

A comparison of the living with the fossil plants of the locality shows that, except for the bald cypress, the plants now growing seem the same as those there in geologic times.

In discussing the conditions attendant on the formation of the ancient flora and its disappearance, Dr. Hollick stated that the land had undergone elevation twice and subsidence twice. The first elevation preceded the formation of the flora which was to be found mainly in the valleys. The area was then depressed and completely submerged, and at length was covered by sand brought in by the waves. After the first elevation and during the first subsidence deposits were formed either *in situ* or at the mouths of the valleys; these, after the second elevation, are now being exposed by erosion. At the present time also a third subsidence is taking place, during which a second series of vegetable deposits are being laid down. The rate of this subsidence has been calculated to be about two feet in the century.

Edward S. Burgess,
Secretary.

COLUMBIA UNIVERSITY GEOLOGICAL JOURNAL CLUB.

November 7.—The following papers were reviewed: Frank Springer, 'Unitacrinus, its Structure and Relations,' by Dr. Austin F. Rogers. M. E. Haug, 'Review of Theories of Glaciation,' from *Revue generale des Sciences,* by Dr. A. A. Julien.

H. W. Shimer,
Secretary.

TORONTO ASTRONOMICAL SOCIETY.

October meeting, President R. F. Stupart, F.R.S.C., Director of the Observatory, in the chair.

Mr. A. F. Miller stated that on three nights he had succeeded in observing the spectrum of comet 'Perrine' (b. 1902); he had seen three bright bands, and occasionally a fourth very faint band. The bright band in the green seemed to correspond to the green band of the Bunsen flame. The bands were sharp towards the red end of the spectrum, indicating the light to be emitted by a hydrocarbon gas. The nucleus gave a continuous spectrum and appeared to consist of several small bright masses involved in the coma. The paper for the evening was entitled 'The Application of Lord Kelvin's Theory of the Ether to the Stellar Universe.' The theories that had led up to the vortex theory were reviewed and an outline of Kelvin's views regarding vortices in a continuous fluid were presented with demonstrations. It was pointed out that the trend of thought amongst observational astronomers just now was to regard the universe as limited rather than infinite in extent. If the continuous ether be limited the envelope would be extremely elastic. A runaway star dashing against the interior surface would rebound without loss of energy. Such a surface would represent a stone wall between the cosmos and blank space beyond. The vortex theory had found favor with physicists because it possessed the virtue of simplicity and offers facilities for explaining certain peculiarities of behavior of matter and ether not otherwise readily explained as elasticity, energy of motion, method of conservation and dissipation (or degradation) of energy and possibly inertia and gravitation as well. The fact that the energy of motion is always as the square of the velocity was cited as evidence that whatever the ultimate nature of energy may be it cannot be *motion per se;* if energy be motion and motion only it could not require fourfold motion to double the motion (velocity) either of matter or ether. The existence of an ether of some sort was undeniable, but theories of its ultimate structure were advanced provisionally as instru-

ments of research to lay hold of the facts and arrange them in something like rational order.

J. R. COLLINS,
Secretary.

DISCUSSION AND CORRESPONDENCE.

A QUESTION IN TERMINOLOGY.

IN replying to Professor Campbell's earnest request to explain a problem in terminology,* I feel as though an apology were necessary for taking space in SCIENCE to state one of the elementary principles of terminology adopted by recent writers on the botanical system. Had Professor Campbell evidenced as much familiarity with the development of the botanical system as followed in continental Europe and America, as with the stereotyped text-book classifications of non-systematic botanists, he would not have credited me with any new proposition in my criticism of his text-book, or have spoken of the system I have attempted to follow as in any sense '*his* system.' The criticism offered was purely a matter of usage or form, and has nothing whatever to do with our conceptions of how this or that group shall be divided, or whether orders or any other categories of classification are all of equal value—another equally elementary problem that would seem to require no answer here.

Modern classification does not commence with the universe and divide it into kingdoms and subkingdoms on the old plan of monarchical and special creation. This has passed from the horizon like Rafinesque's attempts to reduce the forms of thunder and lightning to genera and species. In accordance with prevailing evolutionary conceptions, modern classification does commence with the individual and attempts to show its relationship to other created things. In this view a species is a group of related individuals, and a genus is a group of related species. As we reach the higher category, *tribe,* we have reserved a special termination for the sake of convenience and uniformity, deriving the tribal name from a characteristic genus of the tribe adding the termination EÆ. In a similar way the family is characterized by the termination ACEÆ likewise added to a generic name. This time-honored family termination in plant classification was long abused and muddled by the English school by speaking of families as 'natural orders' of plants, and this practice lingers still among some of the old school in America. So far the recent usage of systematic botany practically coincides with that long in use; in order, however, to coordinate botanical classification more nearly with that long followed in zoology, and to distinguish properly the order from the family, Lindley's termination for the 'alliance' (*cohors* of Bentham and Hooker), -ALES, has been adopted to distinguish the next higher category above the family. A group of related families is, therefore, properly an order and is distinguished by the termination -ALES. This modern system proposed at Berlin, but not always consistently followed even there, calls for rigid adherence to the use of these terminations each for its special category in classification and for that alone. The terminations then indicate the rank of the group—a perfectly rational and eminently practical system. This was a minor part of my original criticism to which Professor Campbell has taken exception. He changed a name which had been duly proposed as a *class—i. e.,* a group of related orders which in this case (*Anthocerotes*) happens to contain a single order and a single family—and used the form '*Class Anthocerotales.*'

To apply the modern system to the pteridophytes, I should say that, from the starting point of the typical ferns (Family Polypodiaceæ), the related families (Cyathe-

* SCIENCE, II. **16**. 705, 31 O. 1902. Had my original criticism (*Torreya,* **2**: 108–111) of Professor Campbell's irregularities in terminology extended to the ferns, I could have mentioned various other inconsistencies; *e. g., Order* Ophioglossa*ceæ, Order* Filices, *Order* Lycopodi*neæ, Class* Equiseta*les,* etc. The ferns are placed in *Class Filicales* at one point (p. 246) and as *Filicineæ* at another (p. 265), where they are grouped into orders. We also have the '*Order* Isoeta*ceæ*' (p. 266) marshaled with other eusporangiates under the Class Filicales, and again appearing as 'The *Isoetineæ,*' 'a distinct *order,*' next to the 'Ord. III. Selaginellineæ' of the Class Lycopodiales. (The *italics* of course are mine.)